

US-PAT-NO: 4402817

DOCUMENT-IDENTIFIER: US 4402817 A

TITLE: Electrochemical prime mover

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After a suitable period, e.g., one second, controller 154 reverses the polarity of the voltage signal applied to the electrodes so that electrodes 100 and 124 function as anodes and electrodes 94 and 126 function as cathodes. This causes ionization of hydrogen molecules in chambers 110 and 134 at electrodes 100 and 130, movement of the ions through the respective membranes 98 and 124, reconversion of the ions to molecules at electrode 94 and 126, and consequent decrease of pressure in compartments 110 and 134. The pressure in compartments 96 and 136 experienced a corresponding increase. Decrease of pressure in compartments 110 and 134 causes closure plates 108 and 132 to move away from one another in response to the elasticity in bellows 106 and 130. This results in movement of fluid from inlet fitting 118 into pumping chamber 135. Back flow of fluid from outlet fitting 119 is prevented by the presence of check valve 121 in outlet bore 116. The foregoing polarity reversals are continued as indicated in FIG. 6 to achieve pumping of fluid from inlet fitting 118 to outlet fitting 119. The rate of pumping can

be controlled by
controlling the repetition rate and shape of the
electrical voltage signal
produced by controller 154.

US-PAT-NO: 5171645
DOCUMENT-IDENTIFIER: US 5171645 A
TITLE: Zirconia-bismuth oxide
graded electrolyte

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A typical solid oxide fuel cell is illustrated in FIG. 1 where item 10 is the electrolyte, item 11 an electrode (anode) and item 12 is an electrode (cathode). A cathode is generally formed of $\text{LaMnO}_{0.3}$ or $\text{LaCoO}_{0.3}$ and is exposed to oxygen or air. The anode is composed of $\text{Ni/ZrO}_{0.2}$ cermet and is exposed to fuel which is typically hydrogen or methane. The cell may be operated in reverse to act as an electrolyzer with a mixture of H_2 and water vapor being introduced to the fuel cell and polarity reversed so that a direct current is introduced to create a voltage potential between the two electrodes with the former cathode becoming the anode to cause oxygen ions to migrate from one electrode through the electrolyte to the other electrode. This is done to regenerate fuel in certain instances such as use aboard space vehicles. In space vehicles, solid oxide fuel cells operate not only to produce energy but also to produce potable water. An SOFC employing the electrolytes of the instant invention performs well as an electrolyzer.

US-PAT-NO: 6126797

DOCUMENT-IDENTIFIER: US 6126797 A

See image for Certificate of Correction

TITLE: Water purifying apparatus
capable of effectively and
reliably producing purified
water with a small chlorine
generator

----- KWIC -----

The timer 116 is for monitoring a first time period during which a standard-polarity voltage is applied and a second time period during which a reverse-polarity voltage is applied to switch the polarity of each of the inner and the outer electrodes 151 and 152 through the polarity switching circuit 118 and the d.c. power supply 119. When the standard-polarity voltage is applied, the inner and the outer electrodes 151 and 152 act as an anode and a cathode, respectively. On the other hand, when the reverse-polarity voltage is applied, the inner and the outer electrodes 151 and 152 act as a cathode and an anode, respectively. The voltage switching circuit 117 is for switching a voltage level between a high level (for example, 20V) and a low level (for example, 10V) and will be referred to as a voltage adjusting arrangement. A combination of the control unit 111, the voltage switching circuit 117, and the polarity

switching circuit 118 is referred to as a voltage applying arrangement.

Alternatively, a current level may be switched between a high level (for example, 1.0 A) and a low level (for example, 0.4 A).

US-PAT-NO: 6132303

DOCUMENT-IDENTIFIER: US 6132303 A

TITLE: Humane crustacean processor

----- KWIC -----

Direct current flows from the negative electrode (cathode) to the positive electrode (anode). In the case of alternating current the electrodes alternate between being cathode and anode continuously as the alternating voltage reverses its polarity and the direction of flow of the current. Alternating current is generally based on a sinusoidal signal producing a wave form similar to that shown in FIG. 1.

DERWENT-ACC-NO: 2003-045539

DERWENT-WEEK: 200304

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TITLE: Plasma source for effusion
cell, has opposing hollow
cathodes in which plasma is
generated based on negative
voltage applied to one
cathode

----- KWIC -----

NOVELTY - An AC power source is arranged such
that when it is applies
negative voltage to a hollow cathode (30), plasma
is generated in the cathode
while an opposing hollow cathode (31) serves an
anode to attract electrons from
the cathode (30). When the polarity of the applied
voltage reverses, plasma is
generated in the cathode (31) and the cathode (30)
serves as the anode to
attract electrons from the cathode (31).

US-PAT-NO: 3963960

DOCUMENT-IDENTIFIER: US 3963960 A

TITLE: Bipolar crossed-field switch
tube and circuit

----- KWIC -----

Under these voltage drop situations, when the polarity reverses as in the AC circuit of FIG. 1, the intermediate electrode 26 alternately acts as an anode and a cathode. As polarity changes, the discharge shifts from one gap to the other so that the outer electrode in each gap alternately serves as cathode.

US-PAT-NO: 3845364

DOCUMENT-IDENTIFIER: US 3845364 A

See image for Certificate of Correction

TITLE: CATHODE ELECTRODE FOR
OPERATION UNDER CONDITIONS OF
REVERSE POLARITY VOLTAGE

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A cathode electrode surface is composed of an Au-Ag alloy of 40 to 90 wt. percent Au, the remainder Ag. The Ag ions are effectively locked into (bound into) the alloy of the cathode electrode surface by the Au constituent so that when the surface is contacted by a liquid or semi-liquid electrolyte, such as sulfuric acid and the like, and subjected to reverse polarity voltage conditions so that the cathode electrode functions as an anode electrode, harmful amounts of Ag are not dissolved in the electrolyte and deposited on the anode electrode. Under conditions of reverse polarity voltage, the anode electrode tends to function like a cathode electrode and the cathode electrode tends to function like an anode electrode. A Au content of less than about 40 wt. percent in the Au-Ag alloy intended for use as a cathode electrode is insufficient to effectively lock Ag ions in the alloy under conditions of reverse polarity. Consequently, harmful amounts of Ag may be dissolved in the

electrolyte from the surface of a Ag containing cathode electrode when subjected to a reverse polarity voltage and deposited on the anode electrode. A Au-Ag alloy wherein the Au content is greater than about 90 wt. percent of the alloy, a loss is experienced in effective cathode capacitance over extended life of the capacitor.

It is desirable that a cathode electrode surface of an electrical device contacted by a liquid or semi-liquid electrolyte be capable of withstanding reverse polarity voltage operating conditions. A cathode electrode surface operating under reverse polarity voltage conditions tends to function like an anode electrode, and while functioning anodically, one or more of the materials of the cathode electrode surface such as Ag ions may be dissolved in the electrolyte in the event the Ag ions is not effectively locked into (bound into) the metal containing material of the cathode electrode surface.

A typical liquid electrolyte capacitor employs a Ag cathode electrode surface and a film-forming metal anode electrode such as a Ta or Nb anode electrode with a sulfuric acid electrolyte contacting the cathode and anode electrode surfaces. A reverse polarity voltage applied to such a capacitor tends to cause Ag ions of the cathode electrode surface to be dissolved in the electrolyte and electrodeposited over the surface of the anode electrode. A reverse polarity voltage having a magnitude of a few millivolts may cause

appreciable reverse polarity current in a capacitor. Re-establishing a voltage of proper polarity may cause a high DC leakage current to flow in the capacitor as a result of the electrolytic dissolution of the Ag ions deposited on the film-forming metal anode electrode during application of a reverse polarity voltage to the capacitor. During electrolytic dissolution of Ag ions from the anode electrode, the capacitor does not operate at its normal operating voltage. This condition continues until the harmful amount of Ag deposited on the anode electrode is dissolved in the electrolyte from the anode electrode, after which the capacitor tends to operate at its normal voltage.

A feature of the present invention is a cathode electrode surface composed of an alloy of about 40 to 90 wt.% Au, the remainder Ag; the cathode electrode surface capable of withstanding voltages of reverse polarity without having harmful amounts of Ag ions dissolved in a liquid or semi-liquid electrolyte and deposited on an anode electrode. Another feature of the present invention is to provide a liquid or semi-liquid electrolyte having a cathode electrode surface of a Au-Ag alloy wherein Ag ions of the alloy are not dissolved in harmful amounts in the electrolyte and deposited on an anode electrode while the cathode electrode is subjected to a voltage of reverse polarity. Another feature of the present invention is a cathode electrode in which the effective cathode capacitance provides good stability under stress conditions, such as

voltage, temperature and time. Other features will be apparent from the following description and drawing.